Inventors: Lamar M. Auman, Douglas J. Love and Brad L. Bachelor

Title of Invention: Locking and Stabilizing Device for Grenades

Serial Number:

Filing Date:

Docket Number: AMPC 5067

LOCKING AND STABILIZING DEVICE FOR GRENADES

DEDICATORY CLAUSE

[0001] The invention described herein may be manufactured, used and licensed by or for the Government for governmental purposes without the payment to us of any royalties thereon.

BACKGROUND OF THE INVENTION

[0002] Currently, grenades such as the M77 and M42 each has a single nylon ribbon whose ends are welded together ultra-sonically so that the ribbon forms a loop. These grenades are normally deployed by being jettisoned out of a missile warhead and must fly toward and impact upon the selected targets. During storage and prior to deployment, the ribbon loop is staked to the grenade arming pin, folded and held in place by one or more clips and a plastic slider-lock. Upon deployment, however, the clips and slider-lock are detached and discarded by aerodynamic forces, allowing the ribbon to unfurl and provide a measure of stabilization to the flight of what is an essentially unstable flying object. Frequently, due to lack of sufficient stabilization during the flight, the grenade falls on its side rather than vertically (or close to vertically) relative to the surface of the intended target. This results in the failure of the grenade to

detonate, increasing the likelihood of a later accidental detonation when its side-lying position is unintentionally or unwittingly disturbed.

SUMMARY OF THE INVENTION

[0003] The locking and stabilizing device for grenades utilizes a solid nylon ring and multiple nylon ribbons that are attached to the ring as well as to the arming pin of the grenade. During storage, the ring locks the slider of the grenade in its storage position for safing. But upon deployment, the ring moves away from the slider under aerodynamic forces, releasing the slider. When the slider is thusly released, it slides out and brings the detonator in position to be impacted upon by the pin when the grenade hits the target. The multiple ribbons extending from the ring unfurl due to the aerodynamic forces and provide stability to the grenade flight.

DESCRIPTION OF THE DRAWING

[0004] Figure 1 shows the preferred embodiment of the locking and stabilizing device.

[0005] Figure 2 illustrates the looping of the ribbons.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[0006] Referring now to the drawing wherein like numbers represent like parts in each of the figures, the structure of the locking and stabilizing device is explained in detail. A typical grenade on which this device can be used has body 1, fuze 2, firing (or "arming") pin 3 and slider 8.

[0007] During storage and handling of the grenade prior to placement in the missile or other carrier vehicle from which it will be dispatched in flight, ring 5 is positioned against the outer perimeter of the slider. Thus, the ring must have a diameter that is slightly larger than that of the slider so as to fit securely around

the circumference of the slider, yet be removable from the slider by aerodynamic forces. The ring may be made of any suitable material such as solid nylon but must be thick enough to maintain its shape when deployed.

[0008] To this ring are attached a plurality of nylon ribbons 7. Even though Figure 1 shows four ribbons, any number of ribbons may be used, depending on the desired degree of stability in the grenade flight. It is noted, however, that an even, rather than an odd, number of ribbons is better suited to achieving stability, especially if they are regularly spaced along the circumference of the ring. Further, no significant additional benefit is expected beyond ten ribbons. The ribbons are ultra-sonically welded to the ring leaving a first portion 4 of each ribbon between the ring and firing pin 3. Front ends 10 of all the ribbons are gathered together and staked to the pin. This allows the ring and the ribbons to remain connected to the grenade upon deployment. Prior to deployment, the ring nestles the slider and the ribbons are folded for compactness.

[0009] When dispatched from the carrier vehicle, aerodynamic forces unfurl the ribbons and pull the ring away from its storage position, allowing slider 8 to slide out and bring the detonator that is inside the slider into position to be impacted upon by the firing pin. The firing pin itself is unscrewed from the fuze by the combination of small oscillations of the grenade during flight and the drag of the ribbons. Now the grenade is armed.

[0010] The stabilization provided by the unfurled ribbons directs the grenade to hit the surface of the target more perpendicularly so as to increase the likelihood of the grenade detonation. The ribbons, when unfurled, may be of varying lengths and widths, depending on the desired degree of stability and expected aerodynamic drag. Usually, the longer lengths will provide greater stability, but storage may be a consideration. Typical entire lengths for the ribbons range from 1 to 6 times the diameter of grenade body 1, while the lengths of first portion 4 may range from 0.25 to 1 times the diameter of the

body. Back ends 11 at the terminus of second portion 9 of the ribbons may remain free as in Figure 1or attached together to form pairs of loops as shown in Figure 2. Paired looping is preferred.

[0011] To assemble the ring and the ribbons, the ring is layed flat and the ribbons are evenly spaced and attached to the ring using an ultrasonic welder. Afterwards, the ring is looped and welded at the ends. In ultrasonic welding, the nylon material in weld zone 6, where the ring and ribbons come together, is flexed by an oscillating force delivered by a horn at rates of 10,000 to 70,000 kHz. This causes the nylon to melt and flow across the joint to form a weld. There are various ways to generate the oscillating force. One is by using a series of tuned components that are sized to form a resonant system when power is applied. The first component converts the electrical power to oscillations which are amplified by a booster that is connected to the horn. The horn can either amplify or de-amplify the oscillations, depending on the needs of the welding application.

[0012] Although a particular embodiment and form of this invention has been illustrated, it is apparent that various modifications and embodiments of the invention may be made by those skilled in the art without departing from the scope and spirit of the foregoing disclosure. Accordingly, the scope of the invention should be limited only by the claims appended hereto.